Code # 657
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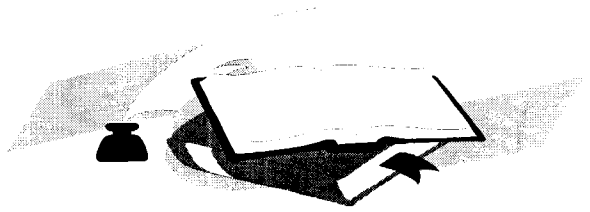
NEW JERSEY

1999-2000 Guidelines and Application



BEST PRACTICES

Deadline for Application to County Office: NOVEMBER 22, 1999

Category SCIENCE (Application is limited to one category. See page 3 for details.)

Practice Name A Treasure Hunt - An Application of Vectors

Number of Schools with Practice _____ (If more than one school, read and complete information on page 2.)

County	Sussex
District (Proper Name)	Kittatinny Regional High School School District
District Address	77 Halsey Road Newton, New Jersey 07860
District Telephone	(973) 383-1800 Fax (973) 383-4392
Chief School Administrator	Mr. Robert G. Walker
Nominated School #1 (Proper Name)	**Kittatinny Regional High School**
School Address	77 Halsey Road Newton, New Jersey 07860
School Telephone	(973) 383-1800 Fax (973) 383-4392
School Principal	Mrs. Susan C. Kappler
Program Developer(s)	Laura Curcione
Chief School Administrator's or Charter School Lead Person's Signature	Robert G Walker

FOR USE BY COUNTY SUPERINTENDENT OF SCHOOLS ONLY

Approved: X Yes ___ No **County Superintendent's Signature** Barry Hedman

NEW JERSEY STATE DEPARTMENT OF EDUCATION

NEW JERSEY
BEST PRACTICES
1999-2000 APPLICATION

Application Requirements:

- **RESPONSES to information and the statements below must be ANONYMOUS.** No reference should be made to the names of the district or the school(s). Use the words "the school" or "the schools" in referring to the applicant in responding to the statements.
- **USE ONLY SPACE PROVIDED ON THE APPLICATION FORM on pages 1, 2 (if applicable) and 4 and THE NUMBER OF LINES SPECIFIED FOR RESPONSES to the statements.** Do not include additional materials; they will not be reviewed in selection process.
- Application must be **keyboarded on 8 ½" x 11" white paper, portrait** format. **Ten-point or larger computer font** or **twelve-pitch or larger typewriter font** must be used. (This sentence is in ten-point.)
- **KEYBOARDED RESPONSES** to the statements below must be **no more than a total of three pages. Keyboard the statement followed by the response** . Format your response to number of lines specified.
- **The information on page 4 and the keyboarded responses** to statements may be printed or copied **on one side of the page. The information on pages 1 and 2 (if applicable)** may be printed or copied **on one side of the page.** Staple pages 1 and 2 (if applicable) and 4 and the keyboarded responses together.
- **The original application must be signed by the district chief school administrator or charter school lead person, indicating his/her approval.**
- **The original and seven copies of the application** must be submitted to the county superintendent of schools by **November 22, 1999**, with the **Itemized List of District Applications** form. Keep the seven copies of each application together with the copy containing the original signature of the district chief school administrator or charter school lead person on the top of each set.
- **FAILURE TO COMPLY WITH PROCEDURES FOR SUBMISSION OF THE APPLICATION MAY RESULT IN THE APPLICATION NOT BEING REVIEWED.**

The following data is required to assist the panelists in the evaluation of the application:

Type of School	Grade Levels
___ Elementary School	_____
___ Middle School	_____
___ Junior High School	_____
_X_ High School	9-12
___ Other: _____	_____

Practice Name A TREASURE HUNT - AN APPLICATION OF VECTORS

Number of Schools with Practice 1

Number of Districts with Practice 1

Check the ONE CATEGORY into which the practice best fits.

___ Arts (Visual and Performing Arts)	___ Educational Technology	___ Safe Learning Environment
___ Assessment/Evaluation	___ Health and Physical Education	___ School-to-Careers/Workplace Readiness
___ Bilingual Education and Diversity	___ Language Arts Literacy	_X_ Science
___ Citizenship/Character Education	___ Mathematics	___ Social Studies
___ Early Childhood Education Programs	___ Professional Development	___ Special Education
___ Educational Support/Guidance and Counseling Programs (services contributing to high student achievement)	___ Public Engagement (family involvement and partnerships with business, community and/or higher education)	___ World Languages

1. Describe the practice proposed for recognition, and lists its objectives. Detail how the practice is innovative, how it promotes high student achievement and how it can be replicated. **(Maximum of 50 lines for response)**

2. Describe the educational needs of students that the practice addresses and how they were identified. List the *Core Curriculum Content and/or Cross-Content Workplace Readiness Standards** addressed by the practice and describe how the practice addresses the standard(s). **(Maximum 50 lines for response)**

3. Document the assessment measures used to determine the extent to which the objectives of the practice have been met. **(Maximum of 60 lines for response)**

*The 1996 edition of the *Core Curriculum Content Standards* published by the New Jersey State Department of Education was disseminated to all districts and charter schools and is available on line through the department's website at http://www.state.state.nj/us/education.

1. Describe the practice proposed for recognition, and list its objectives. Detail how the practice is innovative, how it promotes high student achievement and how it can be replicated. **(Maximum of 50 lines for response)**

The *Treasure Hunt* is a culminating laboratory activity that is part of our Senior Physics course. It is developed during the first three weeks of school. Initially, students are asked to bring in a rock and during the first day or two of school, they spend some time painting it. They are encouraged to use their creativity and this part of the experience has evolved into quite a contest for them. At this point, students don't know why they're decorating rocks but they're having fun. It provides an opportunity for students to develop connections with other students in class and to start the year off on a good note - feeling good and getting enjoyment about being in Physics.

The next related component of the treasure hunt is that the students are given some instruction in using an orienteering compass and grounded in some basic navigation skills. The collateral course work is an introductory unit on Vectors. After a week or so into the unit, they are prepared to recognize, add, and diagram vector quantities. At that point they are given directions for the treasure hunt. They are instructed to go "in the field" on our campus. We have a 92-acre campus but they are restricted to an area immediately surrounding the school which is extensive and a natural environment. They are instructed to find a hiding place for their treasure (their rock). The students are required to plot a course in the field that has a minimum of five vectors and a maximum of ten vectors. Plotting a course means that each of the vectors needs to have a magnitude and direction. Magnitude is determined by pacing and direction is determined by using the orienteering compass.

The students then prepare a treasure map. As this activity has evolved over the years, the treasure map construction has become increasingly creative so that some of the students are very artistic in the maps they create. After preparing the treasure map, they turn them in for teacher review. On the day of the hunt, the students are sent outside to hide their decorated rocks at the final point indicated on their treasure map, so the rock becomes the treasure. While the students are outside, the teacher distributes the treasure maps on the desks so that each student gets another student's map. This is an individual activity so students are working by themselves. The students return from hiding their rocks and pick up the map that they're going to use. The students then go "in the field" with their orienteering compasses and follow the treasure map. The first two students who find rocks and return them to the teacher receive extra credit points and usually some small prize.

When it's done, students are required to prepare a report which includes a copy of the map they've developed and the diagram of their vector map plotted on graph paper. They calculate the resultant vector from the vector addition of all component vectors. Some objectives for the activity include real world applications. Many students are novice drivers and gaining experience in real space direction and distance helps develop a sense of direction needed to apply as drivers. As far as instructional objectives, students are gaining a hands-on experience with vectors, vector addition, resolving component vectors into a resultant. They are doing some work on general problem solving. They are learning how to use an orienteering compass and some basic navigation skills. They are also gaining experience in using relative measurement in the form of paces.

It is innovative in that it incorporates the use of classroom theory in real-world application. It is a great morale booster. The students always indicate that this is one of the highlights of their lab experience in Physics. It gets the year off to a positive start. Students are gaining real world application that has impact not only in understanding the unit in Physics under study but also in everyday life in terms of finding their way around. There are some other tie-in's that are made; e.g., some of the class activities where the students practice navigation skills using maps and compasses to plot pathways. It takes what might be an abstract concept and makes it very concrete for students.

The practice can be replicated by taking the procedure that's outlined in this application and applying it to the individual school situation. Obviously, it was developed in a rural school district with lots of outdoor space, but it could be modified to be conducted in any high school environment. Perhaps the activity might be moved indoors in an inner-city school. The Physics instructor would certainly take the essence of the idea and apply it to the particular physical situations they have. Something similar could be replicated on a tabletop where students would perhaps use a map and compass to plot out a 5 to 10 vector course and calculate the results, etc.

2. Describe the educational needs of students that the practice addresses and how they were identified. List the *Core Curriculum Content and Cross-Content Workplace Readiness Standards** addressed by the practice and describe how the practice addresses the standard(s). **(Maximum of 50 lines for response)**

Students need to develop a facility and comfort with the concept of vectors and vector addition. The students also need to work on the social aspect of functioning as a scientist and learning to solve problems, an atmosphere that encourages development of individual skills in problem solving. The students gain practice in solving vector addition problems by adding up several components that develop that wind up adding up into a resultant. They can also use their skills that they learned in trigonometry that are used in doing some of the regular vector word problems. A significant non-science need is to develop a positive social structure in the classroom.

Science Core Standards addressed by this practice include:

5.1 All students will learn to identify systems of interacting components and understand how their interactions combine to produce the overall behavior of the system.

5.2 All students will develop problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.

5.4 All students will develop an understanding of technology as an application of scientific principles.

5.5 All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.

5.9 All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.

5.10 All students will gain an understanding of the structure, dynamics, and geophysical systems of the earth.

Cross Content Workplace Readiness Standards addressed by this practice include:

1.3 Identify personal interests, abilities and skills.

2.7 Use technology and other tools to solve problems, collect data, and make decisions.

3.7 Conduct systematic observations.

3.8 Organize, synthesize and evaluate information for appropriateness and completeness.

3.15 Apply problem-solving skills to original and creative design projects.

4.1 Set short and long-term goals.

4.3 Evaluate their own actions and accomplishments.

4.9 Use time efficiently and effectively.

3. Document the assessment measures used to determine the extent to which the objectives of the practice have been met. **(Maximum of 60 lines for response)**

As a result of completing the treasure hunt activity, the students are required to submit a report which is a lab report and it receives a lab report grade. The components of the grade include the rock and how well it was prepared so that it could be considered useful for this particular activity. In other words, the rock needs to be identifiable from all other rocks on our campus. The second component is the construction of the map; how well written it is and how clearly the directions were defined.

The final part is the student solution in determining the vector sum of the component vectors. They will plot out on graph paper the course that they followed and do a vector addition to do a resultant vector which indicates their net displacement and net direction of travel.

In the solution of the vector problem, by the time the three weeks have elapsed, the students have several options available for performing their solutions. They can use graphical method; they can use trigonometry to solve their problem, etc. When they are at a point where they need to prepare the report, they have some alternative methods of achieving a solution.

Informal assessment of the practice indicates that it is successful. Student interest is high. Participation is high and enthusiastic. A positive, non-threatening attitude is established immediately at the beginning of the course.

Formal assessment supports the conclusion that the practice is successful. The treasure maps are done well and the directions on the maps are accurate. There is a high degree of success in the vector addition component of the laboratory report. In addition, there is a high degree of success in subsequent applications of these skills.

The feedback that we get from the students is that it is a very positive, meaningful experience for them. They not only enjoy doing it very much, but they also indicate that they get a great deal of understanding of the conceptual aspect of this part of Physics.